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| 10/537,833 | 06/08/2005 | Mikio Sakaguchi | 1422-0678PUS1 | 8685 |
| 2292 7590 07/08/2009 BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747 | | | | |
| EXAMINER KERN, KEVIN P | | | | |
| ART UNIT 1793 | | PAPER NUMBER | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary**Application No.**

10/537,833

Applicant(s)

SAKAGUCHI ET AL.

Examiner

Kevin P. Kerns

Art Unit

1793

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-8,13,15,16,18 and 19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-8,13,15,16,18 and 19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 2, 4-8, 13, 15, 16, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. (US 6,054,073) in view of the publication to IMONO "Application of Mullite Ceramic Beads to Mold Sand" in the Journal of the Japan Foundrymen's Society, 1992 (provided by applicants as references CA and CB in the Information Disclosure Statement of December 23, 2008).

Regarding claims 1, 2, 6, and 13, Kobayashi et al. disclose a method for producing inorganic spherical sand particles, in which the method includes the steps of

supplying raw material (powdery particles) through a burner to pass through a flame (fusing in flame), in which the particles of the raw material include silica, alumina, or a double oxide such as mullite (abstract; and column 2, lines 44-50), such that the raw material ranges in size from 0.5 to 200 microns (column 2, lines 53-54 – and is inclusive of a portion of the claimed range of 50 to 2,000 microns of claims 1, 2, 6, and 13), thus forming spherical particles upon conducting the fusing in flame (abstract; column 1, lines 45-58; column 2, lines 26-28 and 44-59; column 3, lines 34-41; column 6, lines 42-67; column 7, lines 1-40; and Examples).

Regarding the comparison of particle size ranges between Kobayashi et al. and the applicants' claims 1, 2, 6, and 13, MPEP 2131.03 states, "When, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is 'anticipated' if one of them is in the prior art." *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). "When the prior art discloses the range which touches or overlaps the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation." See MPEP 2131.03. In this case, it is the examiner's position that the claimed 0.5 to 200 micron range of average particle sizes defines a substantial overlap with the 0.05 to 2 mm (or 50 to 2,000 micron) range of Kobayashi et al. (with the overlap encompassing the 50 to 200 micron range).

Moreover, one of ordinary skill in the art would have recognized the obviousness of the claimed ranges in view of Kobayashi et al., as set forth in MPEP 2144.05. "In the case where the claimed ranges "overlap" or lie inside ranges disclosed by the prior art" a

prima facie case of obviousness exists.”. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). Also, “A prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient to establish a *prima facie* case of obviousness.”. *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir. 2003). See MPEP 2144.05.

Regarding the applicants' claimed weight ratios of alumina to silica (of claims 1, 6, and 13), Kobayashi et al. do not specifically disclose that the alumina/silica weight ratio of the spherical sand particles is in the (broad) claimed range of from 0.9 to 17 (or from 1 to 15), thus chiefly being alumina-rich in the range of from 0.9 to 17 (or from 1 to 15), which corresponds to about 45% to 94% alumina (or about 50% to 93% alumina). In addition, Kobayashi et al. do not specifically disclose the spherical degree being at least 0.95 (or 0.98) of claims 2, 4, 13, and 15, a low water absorbency of at most 0.8% by weight (independent claim 6), and the use of the spherical casting sand as a casting mold (claims 7, 8, 18, and 19).

However, the publication to IMONO (“Application of Mullite Ceramic Beads to Mold Sand” in the Journal of the Japan Foundrymen’s Society) discloses substantially spherical mullite ceramic beads (Cerabeads) for use in fillers and resin compositions for casting/molding materials, in which the spherical fused mullite ceramic beads (pages 1-3 of translation; Figures 1 and 2; and Tables 1-3, 9, and 10) include a composition of 60.83% alumina and 36.50% silica (see Table 2), which correlates to a weight ratio of 1.67, and further includes an average particle diameter within the range of 36 to 280

mesh (corresponds to a range of 53 to 425 microns), and having a spherical degree of 0.982 to 0.991 (as shown in Table 1 of the Report on Particle Shape Analysis Using Binary Image Analysis of the particle shapes of Cerabeads of IMONO – see reference CC in the Information Disclosure Statement of December 23, 2008), of which the particles are in nearly perfect spherical form, such that a very low water absorption, including those of lower than 0.8 wt% as claimed would result, absent a showing of unexpected results due to the similar processes of manufacture, such that the spherical mullite ceramic beads are used to make casting molds (claims 7, 8, 18, and 19) that include both water and (organic) resin binder composition that would be either furan- or phenol-based, with the spherical mullite ceramic beads (Cerabeads) being advantageous for improved wear, crushing, and thermal shock resistance while having a stable quality when used repeatedly as reclaimed sand (pages 1-3 of translation; Figures 1 and 2; and Tables 1-3, 9, and 10).

Regarding claims 5 and 16, the use of 50% or more (ranging from 50% to 100%) by volume of the claimed spherical molding sand, either alone or in a mixture with “conventional” molding sand would have been obvious to one having ordinary skill in the art, in order to provide the mixed molding sand with improved flowability and de-gassing and to promote mechanical strength of the cured product upon exposure to moisture and humidity, and having optimum thermal expansion rates (see the thermal expansion rates versus heating duration in Figure 10, with Figure 10 illustrating various Cerabead compositions of 0%, 25%, 50%, and 75%). Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed

ranges through process optimization, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980).

It would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to modify the method for producing inorganic spherical sand particles through a fusing in flame process, as disclosed by Kobayashi et al., by using particles having an alumina/silica weight ratio of the spherical sand particles in the claimed range of from 0.9 to 17 (or from 1 to 15), an average particle diameter within the range of 10 to 50 microns while having a high spherical degree of at least 0.95 (or 0.98) and a low water absorbency (of at most 0.8% by weight), as taught and/or suggested by IMONO, in order to improve flowability and de-gassing (Anzai et al.; column 1, lines 36-49) and to promote mechanical strength (IMONO; pages 1 and 2 of translation).

Response to Amendment

4. The declaration under 37 CFR 1.132 filed June 4, 2009 is sufficient to overcome the rejection of claims 1, 2, 4-8, 13, 15, 16, 18, and 19 based upon the combination of Kobayashi et al. and Anzai et al. due to the teachings of unexpected results of the use of the specified claimed ratios of alumina to silica.

Response to Arguments

5. The examiner acknowledges the applicants' remarks/arguments and declaration under 37 CFR 1.132 received by the USPTO on June 4, 2009. Although the declaration under 37 CFR 1.132 overcomes the prior 35 USC 103(a) rejections for the reason set forth in above section 4, the newly applied reference to IMONO "Application of Mullite Ceramic Beads to Mold Sand" in the Journal of the Japan Foundrymen's Society is deemed to render obvious the teachings of the specified claimed ratios when combined with Kobayashi et al. (see the 35 USC 103(a) rejections in above section 3). Claims 1, 2, 4-8, 13, 15, 16, 18, and 19 remain under consideration in the application.
6. Applicants' arguments with respect to claims 1, 2, 4-8, 13, 15, 16, 18, and 19 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin P. Kerns whose telephone number is (571)272-1178. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kevin P. Kerns
Primary Examiner
Art Unit 1793

/Kevin P. Kerns/
Primary Examiner, Art Unit 1793
June 29, 2009